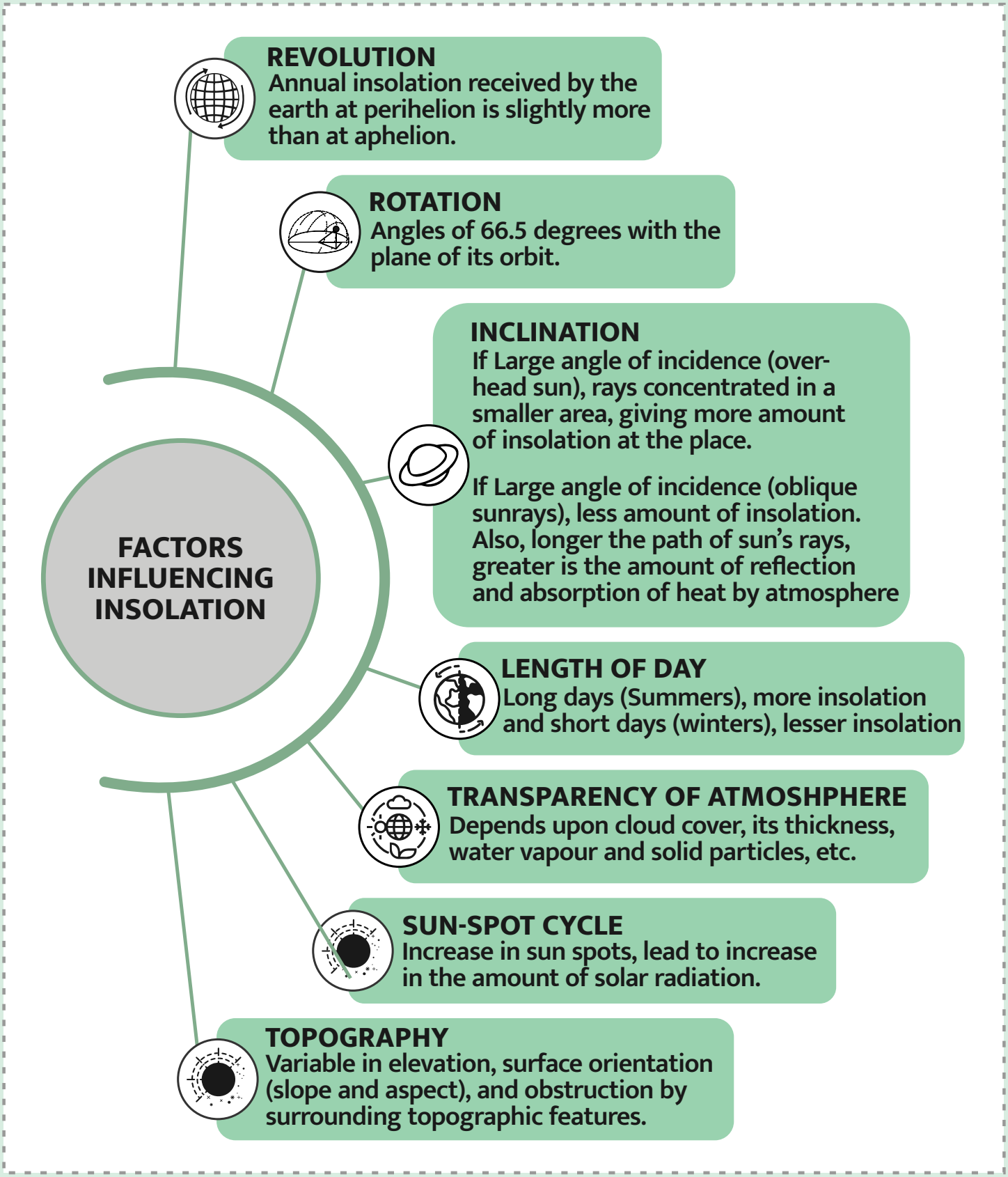
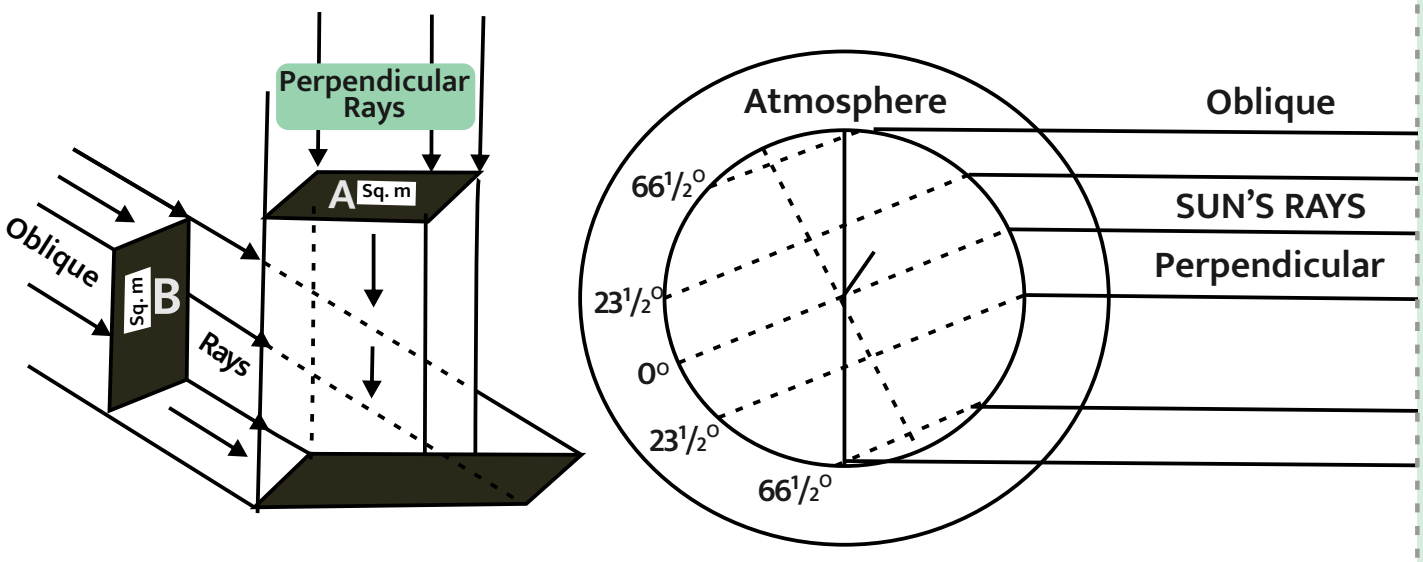
VISIONIAS
INSPIRING INNOVATION

QUICK REVISION MODULE (UPSC PRELIMS 2022) GEOGRAPHY

INSOLATION

1.1 HEAT AND LIGHT RECEIVED THROUGH SPACE FROM THE SUN. UNIT OF MEASUREMENTS OF THIS ENERGY IS LANGLEY (LY).



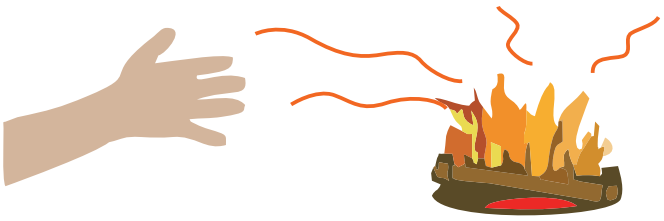


EFFECT OF ANGLE OF INCLINATION ON INSOLATION

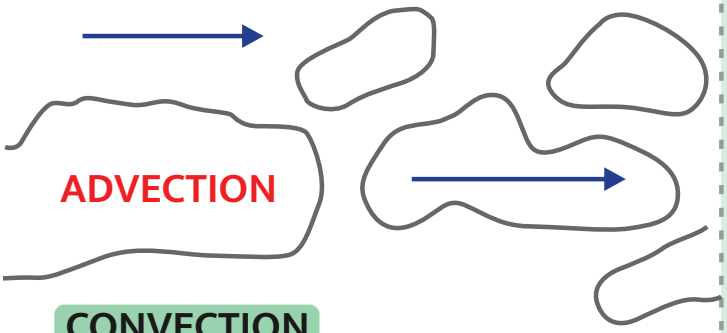
Maximum insolation is received over the subtropical deserts. Equator receives comparatively less insolation than the tropics due to presence of clouds. At the same latitude the insolation is more over the continent than over the oceans. Atmosphere gets more heat from the terrestrial radiation, than from insolation.

1.2 Heating and Cooling of the Atmosphere

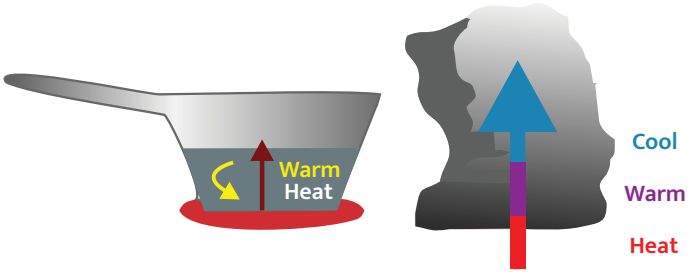
RADIATION
Energy is transferred by electromagnetic radiation.



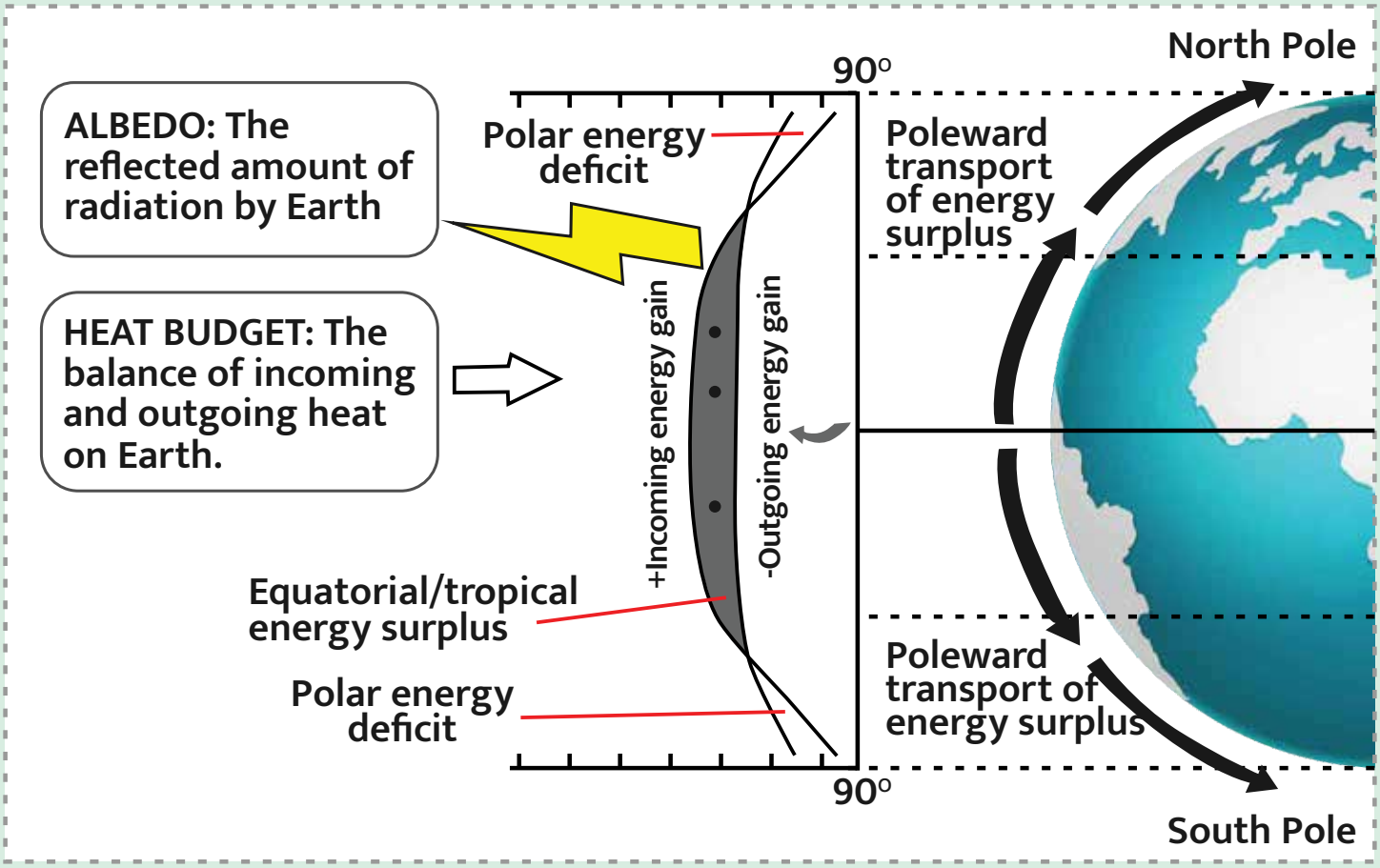
CONDUCTION
Energy is transferred by direct contact.



CONVECTION
Transfer of heat through horizontal movement of air.



2. HEAT BUDGET



3. TEMPERATURE:

FACTORS AFFECTING THE TEMPERATURE

Latitude
Moving from equator towards poles the inclination of the Sun's rays increase.

Altitude
Lower layers of the atmosphere are comparatively warmer than the upper layers.

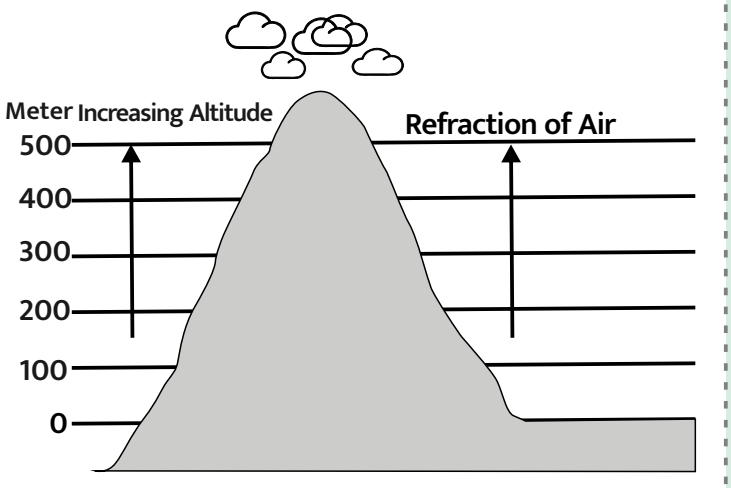
Distance from the Sea
Moderating effect due to nearness to sea, while interior areas have extremes of temperature..

Ocean Currents
Limited to the adjoining coastal areas.

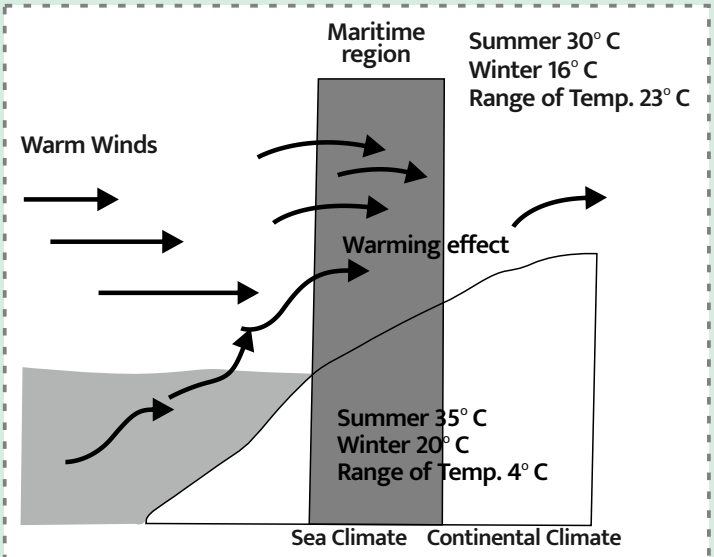
Air-mass circulation
Air masses in form of winds helps in the redistribution of temperature.

Slope, Shelter and aspect
Slopes of a mountain facing the sun experiences high temperature than the slopes on the leeward side.

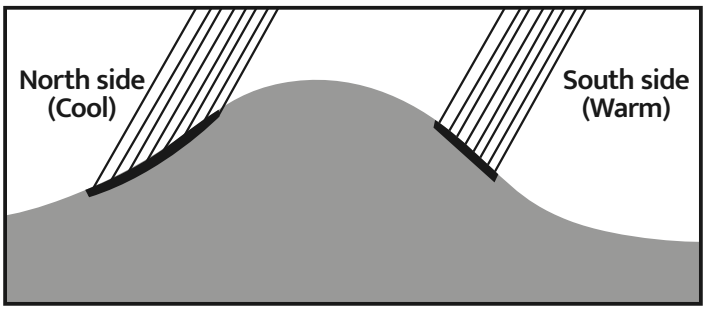
Nature of ground surface
Snow has very high albedo, thus reflects much if the insolation.
Sandy surface record high temperature due to absorpation



(a) -effect of altitude



(b) -maritime influence



3.1 DISTRIBUTION OF TEMPERATURE:

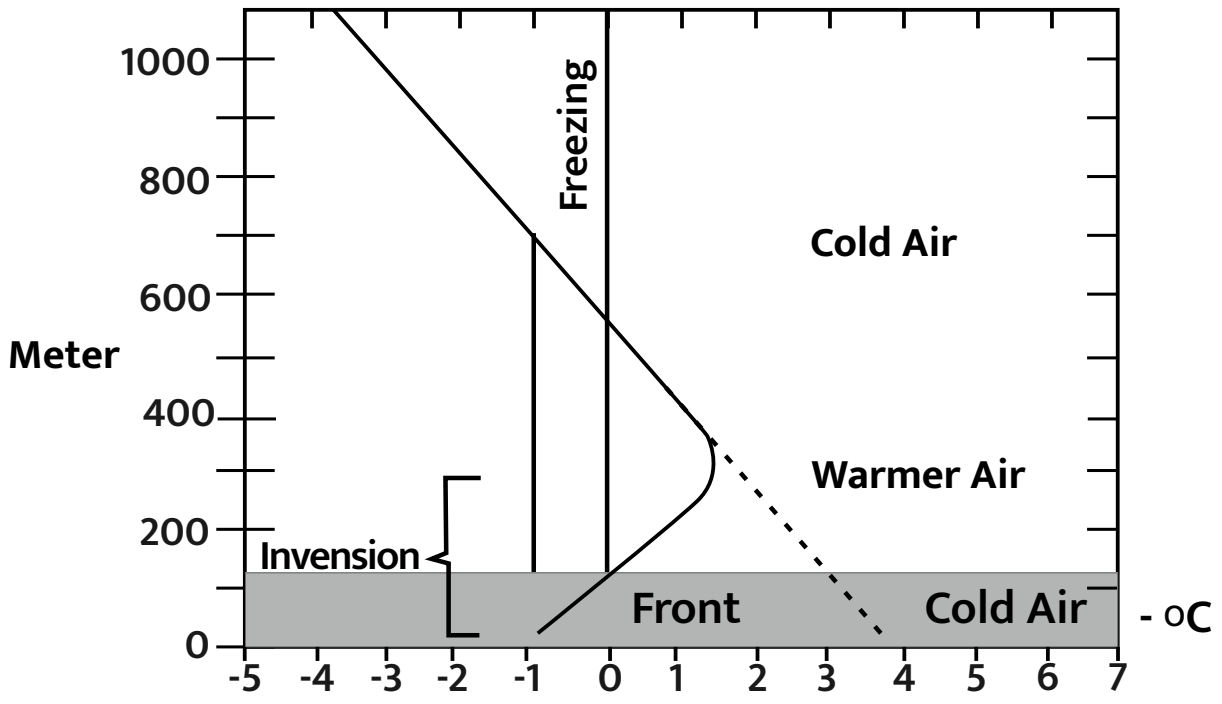
JANUARY	JULY	TERMS	SIMILAR ASPECT
Isotherms deviate to the north over the ocean and to the south over the continent.	Isotherms generally parallel to the latitude.	Isotherms	Line joining places having equal temperature.
		Isobars	Line joining places having equal pressures.
In southern hemisphere, more or less parallel to the latitudes due to less landmass and the variation in temperature.		Isohaline	Salinity (amount of salt) of sea water is same.
		Isohyte	Amount of precipitation is same.
		Isohel	Amount of sunshine is same.

Temperature Anomaly: Difference between the mean temperature of any place and the mean temperature of its parallels. Maximum temperature anomalies are found in the Northern hemisphere.

Isotherms are generally parallel to equator. Closely drawn isotherms indicate rapid change in temperature and vice-versa.

3.2. Temperature Inversion: Generally, temperature decreases with normal lapse rate (6.5°C per 1,000 m). The rise of temperature with height is known as Temperature inversion.

CONDITIONS	REASONS
Long winter nights	The bottom layer of atmosphere in contact with the ground is also cooled and the upper layer remains relatively warm.
Cloudless clear sky	No obstruction to the terrestrial radiation.
Dry air	No obstruction to the terrestrial radiation.
Calm atmosphere	Cold air stays put near the ground.
Ice covered surface	Air in contact with it is also cooled but the upper layer remains warm.

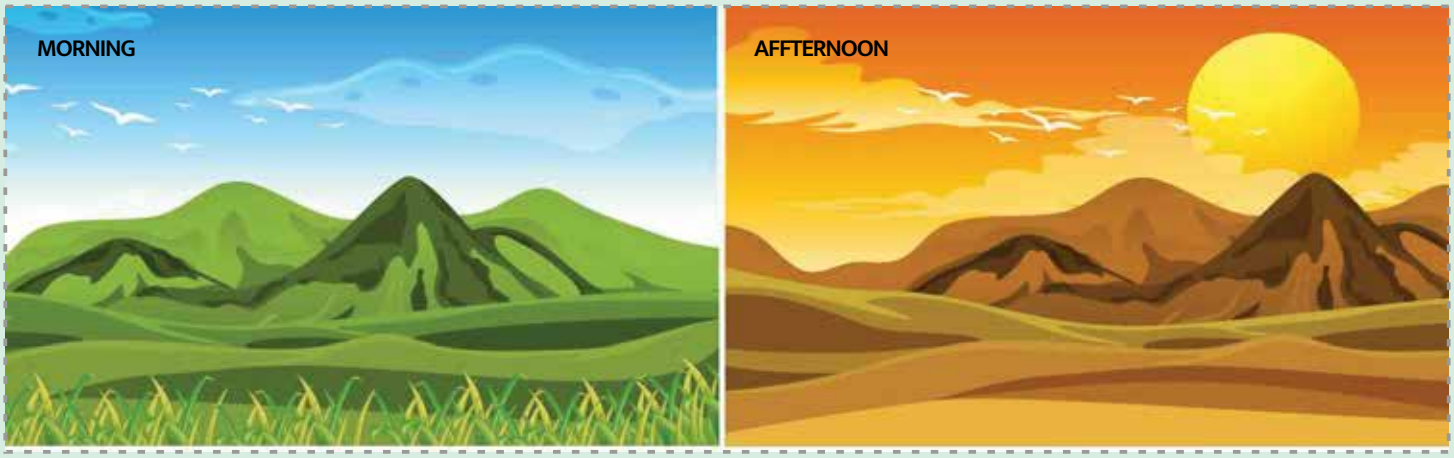


EFFECT OF TEMPERATURE INVERSION ON HUMAN

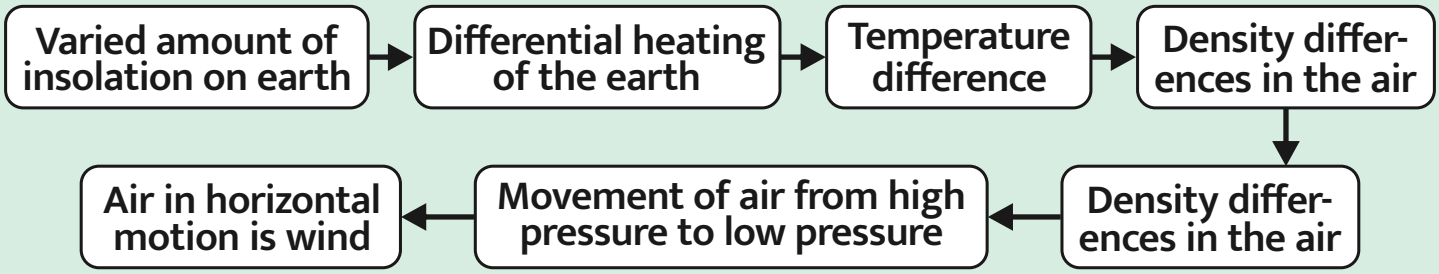
- Form dense fog near the earth's surface and causing problems in breathing
- Valleys people settles down on the upper-slopes
- Use of fire or big blowers, to drain off the area

3.3 TEMPERATURE RANGES:

DIURNAL RANGE OF TEMPERATURE	Daily pattern of temperature change. Generally minimum is Just before sunrise and maximum is about 2:00 PM.
ANNUAL AVERAGE RANGE OF TEMPERATURE	Difference between the average temperature of hottest month and average temperature of the coldest month of the year. Lower in low latitudes and higher in high latitudes.

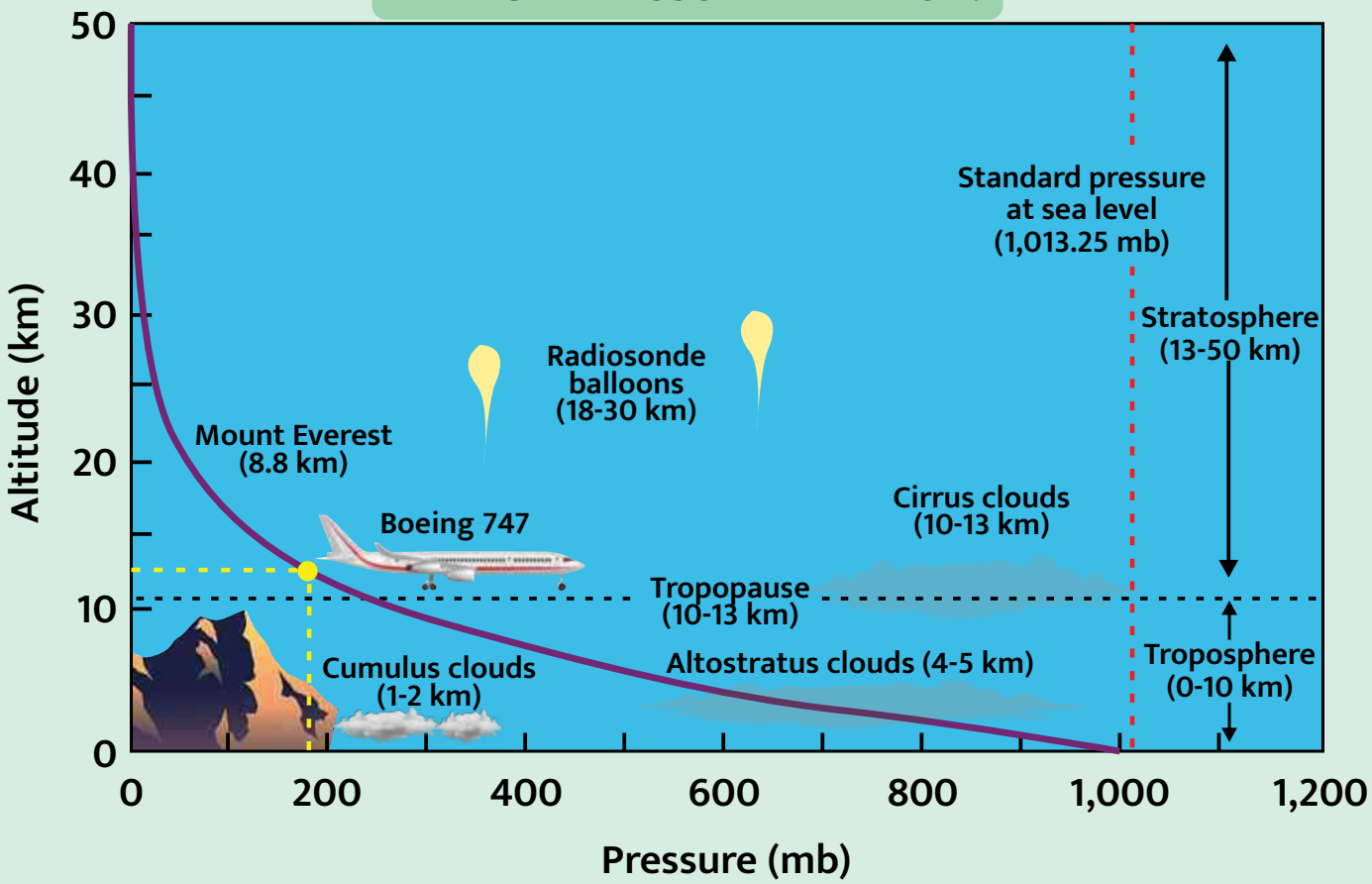


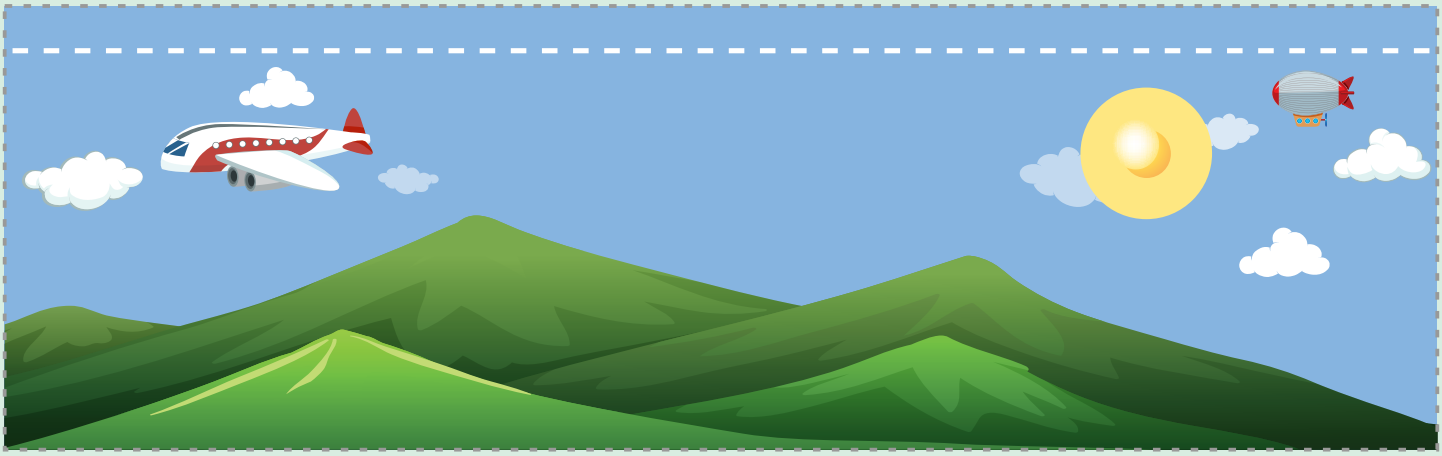
4. ATMOSPHERIC CIRCULATION



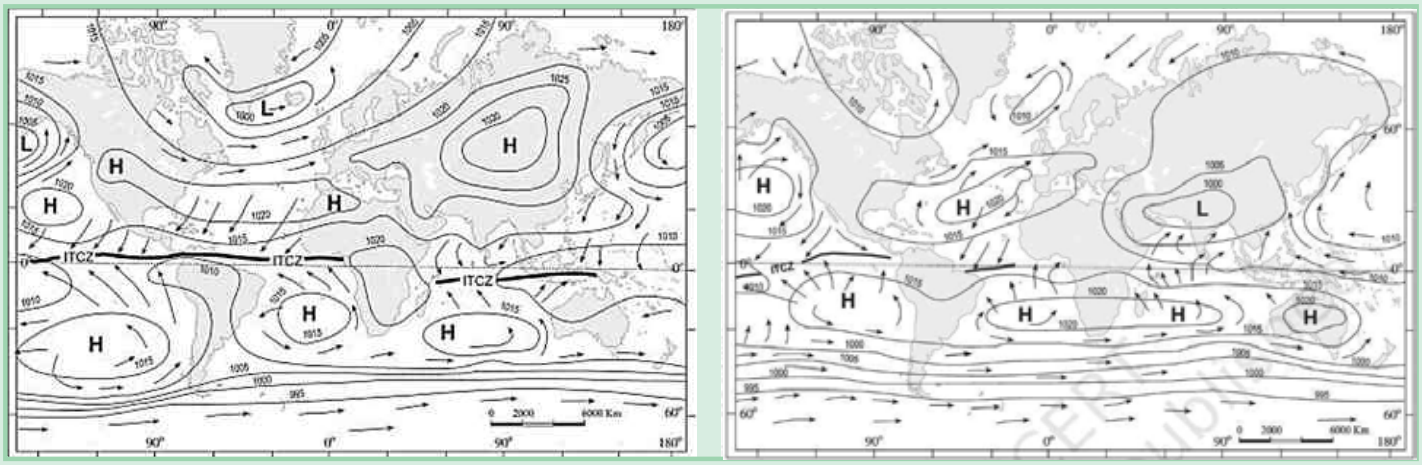
4.1 PRESSURE VARIATIONS:

VERTICAL PRESSURE VARIATION:



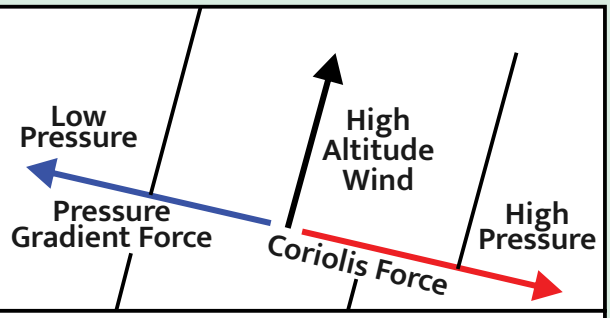
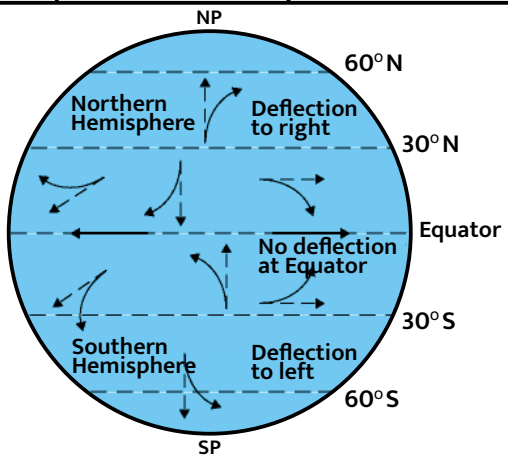
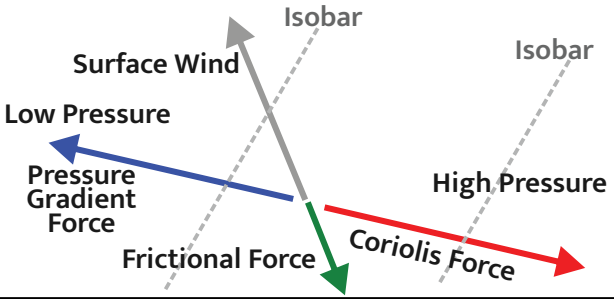


JANUARY MONTH	JULY MONTH



Horizontal movement of air in response to difference in pressure is termed as wind while vertical or nearly vertical moving air is called air current.

4.2 FORCES GOVERNING AIR MOVEMENT:

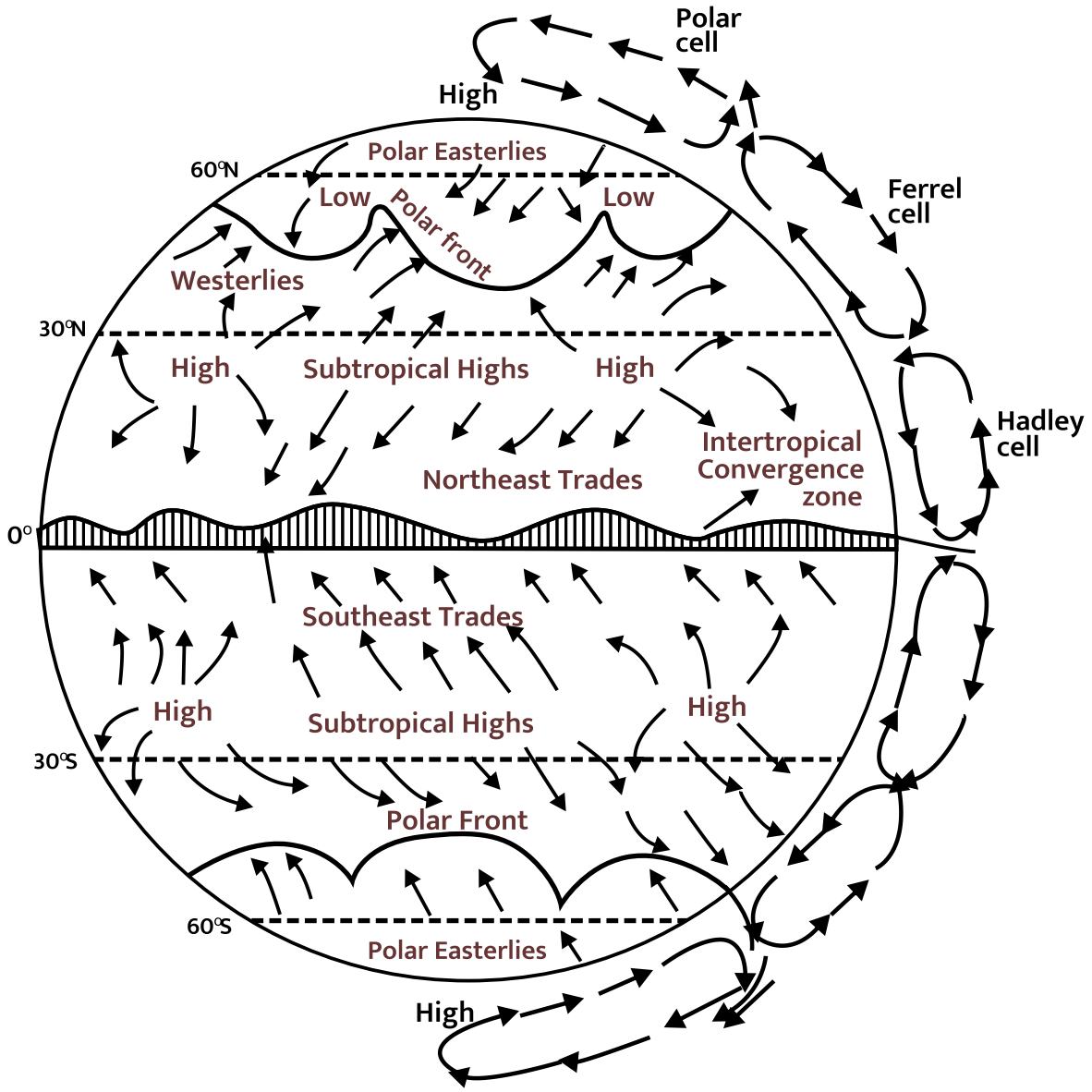
Pressure Gradient	Rate of change of pressure with respect to distance.	
Coriolis Force	The deflection is always to the right of the direction of motion in the northern hemisphere and to the left in the southern hemisphere.	
Centripetal Force	Force which is acting centripetally, pulling air inwards.	
Frictional Force	Greatest at the surface and influence generally extends Up to an elevation of 1 - 3 km	

4.3 DISTRIBUTION OF PRESSURE BELTS:

Sub-tropical high pressure belt:
1. 25 to 35 degree N-S latitudes.
2. Cold and heavy winds descends, resulting high pressure.
3. Horse latitude.

Equatorial low pressure belt:
1. 10-degree N-S latitudes.
2. Thermally produced.
3. Doldrums.
4. Inter Tropical Convergence Zone (ITCZ)

Sub-polar low pressure belt:
1. Along 60-degree latitudes (55-65) in both the hemisphere.
2. low pressure due to winds coming from the subtropics and the polar regions converge in this belt and rise upward.
3. Sub-Antarctic low.



In the Middle latitudes (30-60 degree) due to convergence at sub-polar low resulting uplifting and sinking at sub-tropical high froming Ferrel cell.

Easterlies from either side of the equator converge in the ITCZ. Thus, winds originated at ITCZ come back in a circular fashion forming Hadley cell.

Polar high pressure belt:
Thermally induced due to low temperature.

4.4 SHIFTING OF BELTS:

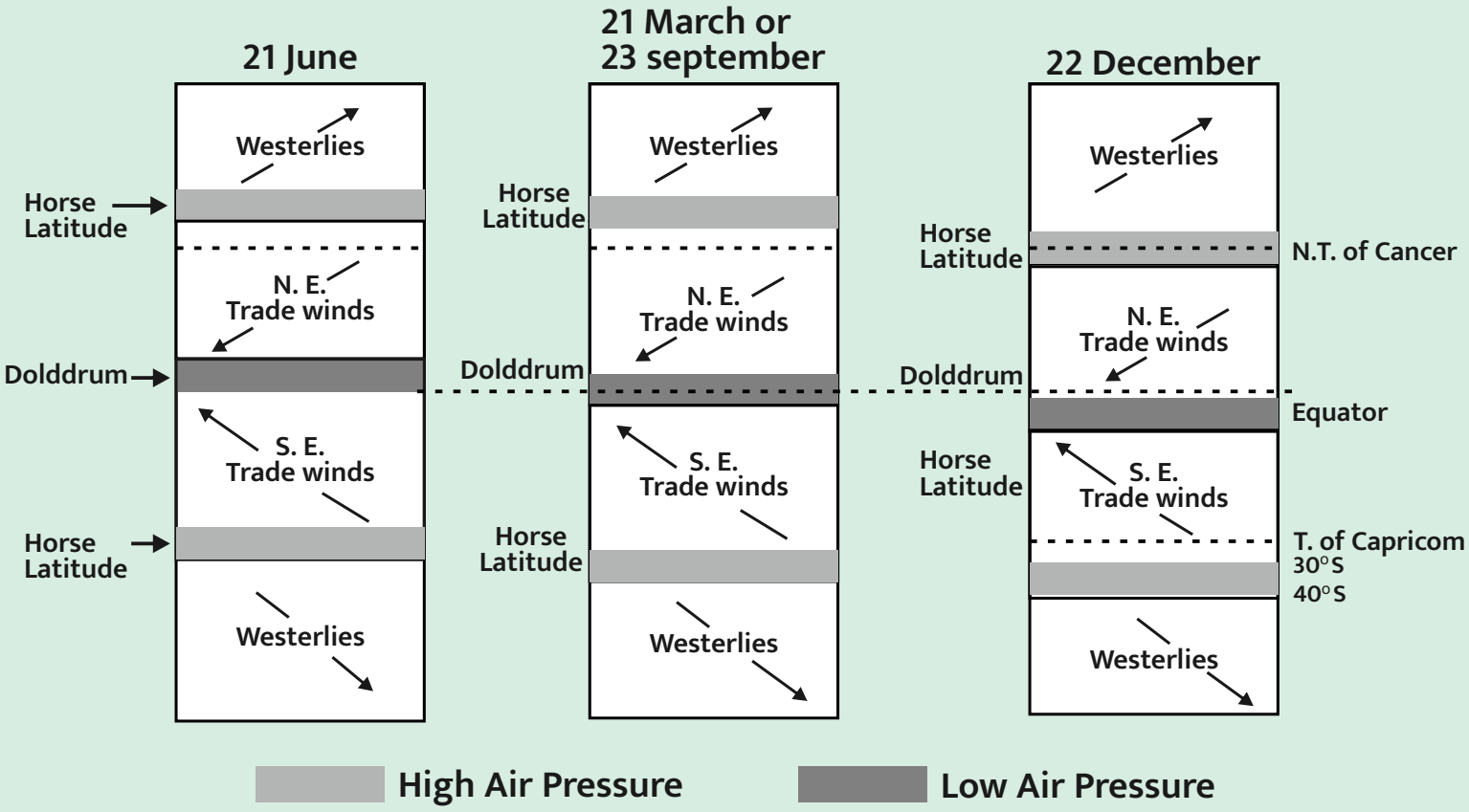
The pressure belts swing around equator:

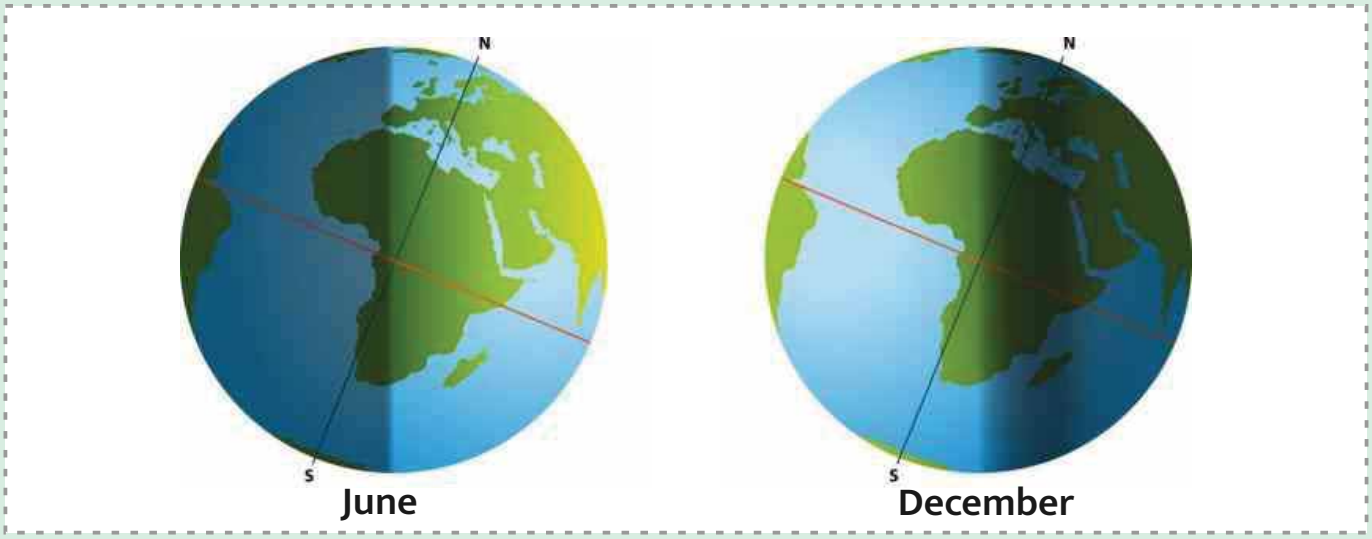
1. To the north of equator (in July)
2. To the south of equator (in Dec)

Reason: Due to the apparent annual migration of the sun

Low pressure equatorial belt extends till tropic of cancer.

Extends to latitudes 10-15degrees south.





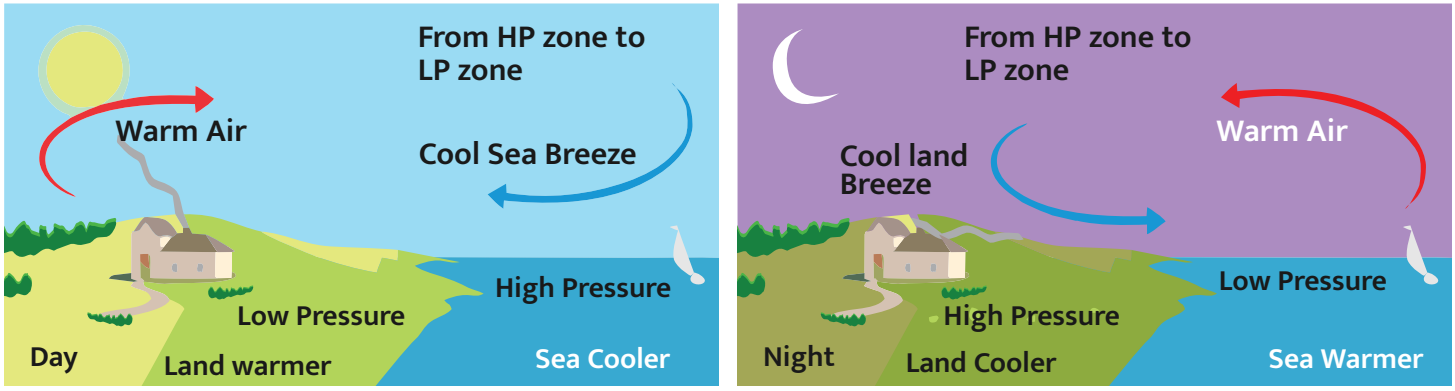
4.5 General Circulation of the Atmosphere:

4.5.1 Primary circulation or Planetary Winds: Related to the general arrangement of pressure belts on the earth's surface.

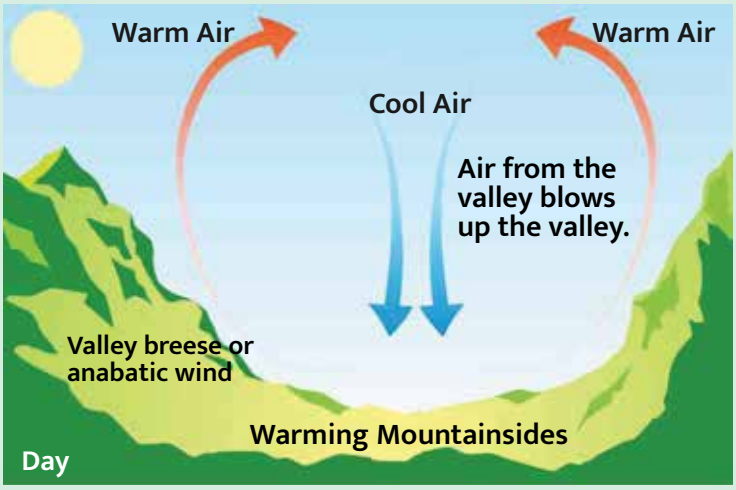
Wind and Latitude	Region	Circulation Cell	Direction (Northern and Southern Hemisphere respectively)
Tropical easterlies or trade winds (30-degrees N-S)	Inter Tropical Convergence Zone (ITCZ) and surrounding	Hadley Cell	North-east and South-east
Westerlies Middle latitudes (30-60-degree N-S)	Horse latitude	Ferrel cell and Polar cell	West to east. In southern Hemisphere: Roaring forties, furious fifties, and screaming sixties.
Polar easterlies (Beyond 60-degrees N-S)	Polar region	Polar cell	From east towards west.

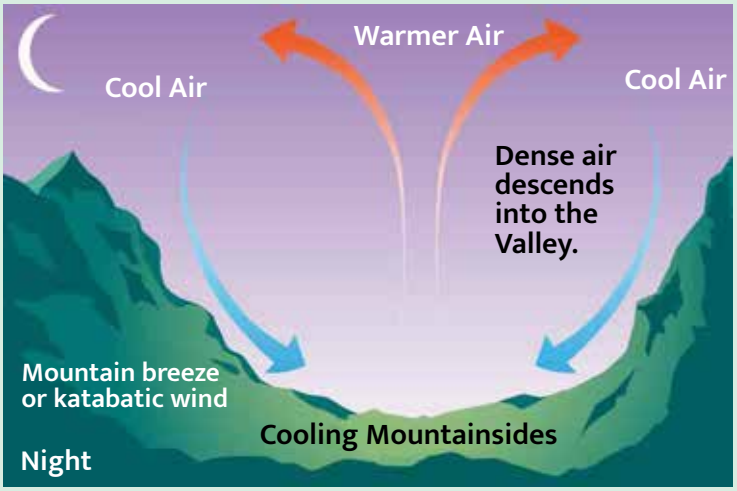
4.5.2 Local Winds:

4.5.2.1 The Land and Sea Breezes



4.5.2.2 The Mountain and Valley Breezes





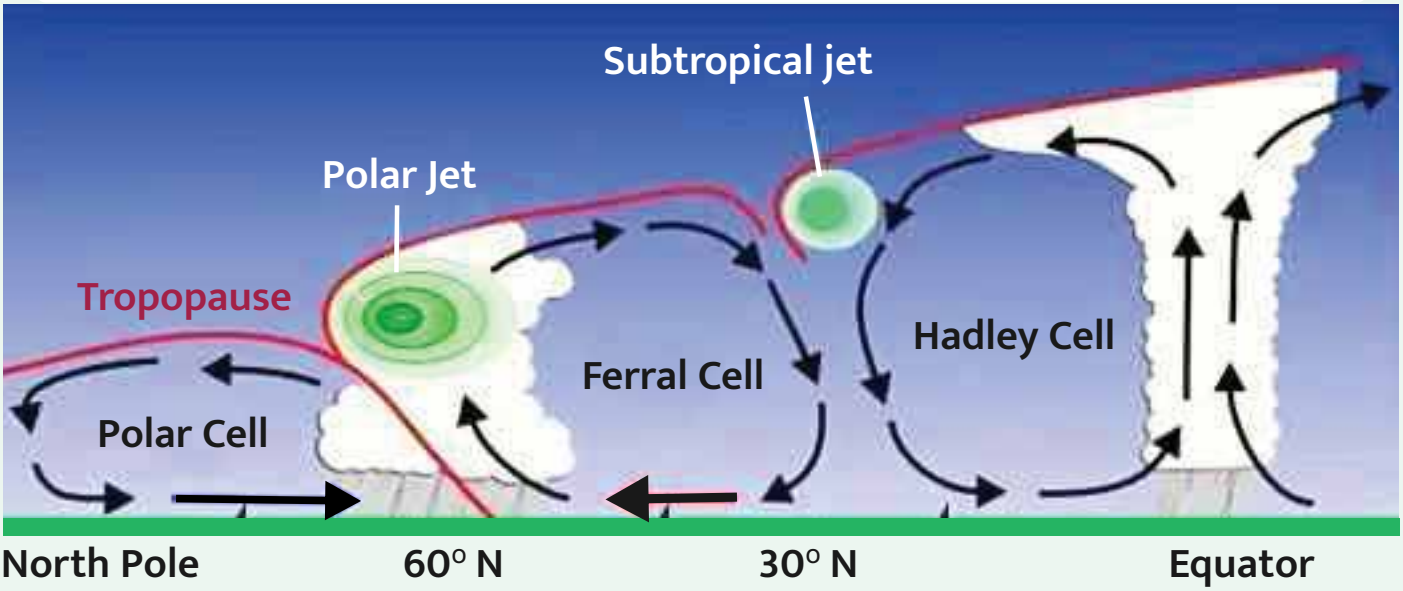
4.5.2.3 Other local winds:

Name	Hot	Dry	Moist	Cold	Very Cold	Location
Loo	✓	✓				Northern plains of India and Pakistan. West to east direction.
Foehn	✓	✓				Leeward side of the Alps mountain ranges.
Chinook	✓	✓				Eastern slopes of the Rockies in U.S.A. and Canada
Sirocco	✓		✓			Sahara desert to Mediterranean sea.
Khamsin	✓	✓				Egypt.
Harmattan	✓	✓				Northwest Africa from the northeast
Mistral		✓			✓	Alps towards the Mediterranean Sea
Bora		✓		✓		Blowing down from the mountains in the Adriatic Sea region (Italy)
Blizzard					✓	Antarctic
Brickfielder	✓	✓				Southern Australia
Pampero			✓			Pampas of Argentina and Uruguay.

4.6 Upper Air Circulation (Jet Stream):

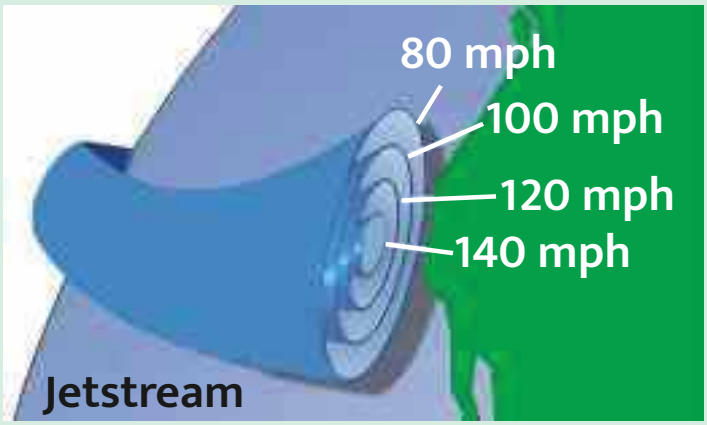
Two permanent jet stream zones in each hemisphere:

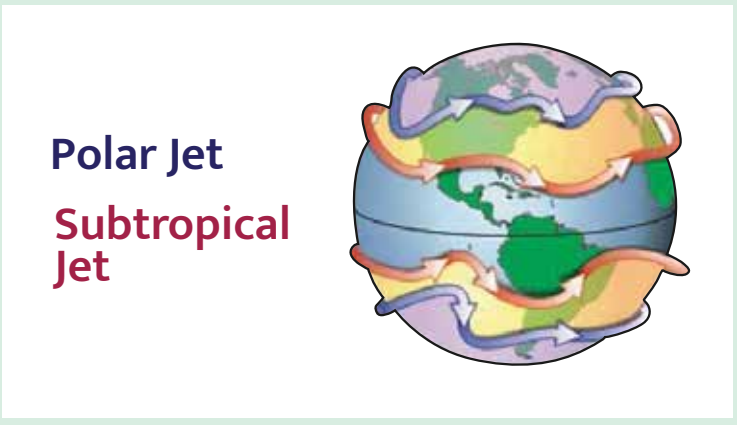
1. Sub-tropical jet stream.
2. Polar front jet stream.



Jet Stream: Concentrated bands of rapid air movement.

1. High altitude near the top of the troposphere.
2. Speed varies from 110 kmph in the summer season to 180 kmph in the winter season.
3. Shape is circular and the speed is strongest in the centre.
4. Circulation path is wavy and meandering, known as Rossby waves.
5. Follow the apparent movement of sun.





4.6 Upper Air Circulation (Jet Stream):

Type

- Polar front jet stream (40-60 degree N-S in both hemisphere)
- Sub-tropical jet stream 25-30 degrees N-S in both the hemispheres.
- Eastern Tropical Jet Stream Between equator and 20-degrees north in south- east Asia, India and Africa

Features

- Origin due to temperature difference. More meandering path than the Sub Tropical Jet Stream. Swings towards poles in summers and towards equator in winter.
- Blows constantly, speed is comparatively lower than polar jet, Swings to the north of Himalayas in summer in North India.
- Seasonal in nature, Eastern direction which is opposite to that of other two jet streams, located comparatively at higher height.

Consequences of jet stream

- Affect weather conditions.
- Contribute to originating cyclones, anticyclones, storms and depressions.
- Bursting of monsoon in India: Related to Eastern Tropical Jet.
- Speed and considerably save fuel to aeroplanes if flowing in same direction. Still various unknown aspects.